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Report on the individual review of the annual submission of Spain submitted in 2014*

* In the symbol for this document, 2014 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2014 annual submission of Spain, coordinated by the UNFCCC secretariat, in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines). The review took place from 15 to 20 September 2014 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Newton Paciornik (Brazil) and Ms. Melissa Weitz (United States of America); energy – Mr. Leonidas Osvaldo Girardin (Argentina), Ms. Gherghita Nicodim (Romania) and Mr. Anand Sookun (Mauritius); industrial processes and solvent and other product use – Mr. Erhan Unal (Turkey) and Ms. Sina Wartmann (Germany); agriculture – Mr. Paul Duffy (Ireland), Mr. Bernard Hyde (Ireland) and Mr. Yuriy Pyrozhenko (Ukraine); land use, land-use change and forestry (LULUCF) – Mr. Valentin Bellassen (France), Mr. Zoltan Somogyi (Hungary) and Ms. Diana Vargas (Colombia); and waste – Ms. Maryna Bereznytska (Ukraine) and Ms. Riitta Pipatti (Finland). Ms. Bereznytska and Mr. Paciornik were the lead reviewers. The review was coordinated by Mr. Roman Payo (UNFCCC secretariat).

2. In accordance with the Article 8 review guidelines, a draft version of this report was sent to the Government of Spain, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2013 annual review report of Spain was published after 15 April 2014, which may have affected the Party's ability to implement recommendations and encouragements made in the previous review report.

3. All recommendations and encouragements included in this report are based on the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines. The ERT has not taken into account the fact that Parties will prepare the submissions due by 15 April 2015 using the revised "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" adopted through decision 24/CP.19. Therefore, when preparing the next annual submissions, Parties should evaluate the implementation of the recommendations and encouragements in this report, in the context of those guidelines.

4. In 2012, the main greenhouse gas (GHG) emitted by Spain was carbon dioxide (CO_2), accounting for 81.2 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (9.5 per cent) and nitrous oxide (N_2O) (7.0 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.3 per cent of the overall GHG emissions in the country. The energy sector accounted for 77.9 per cent of total GHG emissions, followed by the agriculture sector (11.1 per cent), the industrial processes sector (6.9 per cent), the waste sector (3.8 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 340,808.59 Gg CO_2 eq and increased by 19.1 per cent between the

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

base year[2] and 2012. The ERT concluded that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

5. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively.

6. Information to be included in the compilation and accounting database can be found in annex I to this report.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

7. The 2014 annual submission was submitted on 15 April 2014; it contains a complete set of common reporting format (CRF) tables for the period 1990–2012 and an NIR. Spain also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2014. The annual submission was submitted in accordance with decision 15/CMP.1.

8. The list of other materials used during the review is provided in annex II to this report.

2. Question(s) of implementation raised in the 2013 annual review report

9. The ERT noted that no questions of implementation have been raised in the 2013 annual review report.

3. Adjustment applied in the previous annual review report

10. The ERT noted that, consistent with paragraph 11 of decision 20/CMP.1, Spain has submitted revised estimates for a category in its inventory to which an adjustment was previously applied. Specifically, Spain submitted revised estimates for N_2O emissions from pasture, range and paddock manure for all years in the period 1990–2011.[3] The ERT has reviewed the revised estimates and accepted them (see paras. 48 and 60 below). The main reason for the recalculations is the modification of the methodology used to estimate emissions from pasture, range and paddock manure in line with the recommendations made in the previous review report. The ERT concludes that the revised estimates of N_2O emissions from pasture, range and paddock manure for all years in the period 2008–2011 shall replace the adjusted estimates in the compilation and accounting database.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from sources included in Annex A to the Kyoto Protocol only.

[3] For a discussion of the original adjustment case, please refer to document FCCC/ARR/2013/ESP, paragraphs 126–140.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by gas, base year[a] to 2012

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources		CO_2	227 508.03	227 508.03	262 860.03	333 181.72	293 732.29	280 377.63	280 922.73	276 636.64	21.6
		CH_4	26 218.13	26 218.13	28 129.54	32 486.04	33 284.40	32 337.27	32 305.90	32 318.02	23.3
		N_2O	26 632.07	26 632.07	25 297.61	25 064.13	24 796.66	25 949.05	24 556.82	24 018.78	–9.8
		HFCs	4 880.33	2 441.16	4 880.33	7 327.35	7 519.76	8 203.19	7 790.09	7 574.17	55.2
		PFCs	832.34	882.92	832.34	120.66	84.17	72.71	64.78	41.17	–95.1
		SF_6	108.34	66.92	108.34	264.25	241.88	241.15	246.82	219.81	102.9
KP-LULUCF	Article 3.3[b]	CO_2				–7 944.63	–8 013.31	–8 081.05	–8 047.33	–7 929.31	
		CH_4				1.66	4.81	4.76	5.91	10.50	
		N_2O				11.75	12.48	11.85	11.35	11.20	
	Article 3.4[c]	CO_2	–1 053.62			–25 491.44	–24 645.31	–25 057.37	–25 293.32	–25 412.38	NA
		CH_4	IE, NE			22.92	60.53	58.61	73.23	125.06	NA
		N_2O	17.12			207.91	213.88	198.73	185.25	175.55	NA

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NE = not estimated.

[a] The base year for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2012

			Gg CO_2 eq								*Change (%)*
		Sector	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources		Energy	211 714.60	211 714.60	248 537.64	314 667.73	280 164.53	265 876.02	268 401.05	265 549.07	25.4
		Industrial processes	28 280.57	25 850.56	26 907.59	31 675.55	26 679.81	27 811.19	25 242.66	23 409.03	–17.2
		Solvent and other product use	1 512.13	1 512.13	1 717.29	1 793.80	1 639.17	1 595.42	1 438.89	1 262.81	–16.5
		Agriculture	37 658.52	37 658.52	36 311.19	38 013.21	38 067.93	39 305.25	37 915.43	37 714.79	0.1
		Waste	7 013.43	7 013.43	8 634.50	12 293.87	13 107.72	12 593.13	12 889.12	12 872.89	83.5
		LULUCF	NA	–23 304.79	–23 949.29	–34 081.86	–33 235.56	–33 611.47	–33 691.37	–33 528.63	NA
		Total (with LULUCF)	**NA**	**260 444.44**	**298 158.90**	**364 362.29**	**326 423.59**	**313 569.53**	**312 195.78**	**307 279.97**	**NA**
		Total (without LULUCF)	**286 179.23**	**283 749.22**	**322 108.19**	**398 444.15**	**359 659.15**	**347 181.00**	**345 887.15**	**340 808.59**	**19.1**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation				–8 660.70	–8 725.02	–8 719.50	–8 683.03	–8 558.41	
		Deforestation				729.48	728.99	655.06	652.95	650.79	
		Total (3.3)				**–7 931.22**	**–7 996.03**	**–8 064.44**	**–8 030.07**	**–7 907.62**	
	Article 3.4[d]	Forest management				–23 975.70	–23 802.05	–23 758.53	–23 696.96	–23 594.55	
		Cropland management	–1 036.50			–1 284.91	–568.85	–1 041.50	–1 337.88	–1 517.22	46.4
		Grazing land management	NA			NA	NA	NA	NA	NA	NA
		Revegetation	NA			NA	NA	NA	NA	NA	NA
		Total (3.4)	**–1 036.50**			**–25 260.61**	**–24 370.90**	**–24 800.03**	**–25 034.84**	**–25 111.77**	**NA**

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] The base year for Annex A sources is the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

4. Overall assessment of the inventory

11. Table 3 contains the ERT's overall assessment of the annual submission of Spain. For recommendations for improvements for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

Issue	*ERT assessment*	*General findings and recommendations*
The ERT's findings on completeness		
Annex A sources[a]	Complete	Mandatory: none
		Non-mandatory: N_2O emissions from solid fuel transformation, CO_2 emissions from coal mining and handling, CO_2, CH_4 and N_2O emissions from other (fugitive emissions from solid fuels), N_2O emissions from storage and refining of oil , CO_2 and CH_4 emissions from other leakage (natural gas) at industrial plants and power stations, and commercial and residential sectors, and N_2O emissions from flaring of oil in refineries in the energy sector; potential emissions of HFCs from refrigeration and air-conditioning equipment, foam blowing, fire extinguishers and aerosols/MDI, potential emissions of PFCs from refrigeration and air-conditioning equipment, fire extinguishers and aerosols/MDI, and potential emissions of SF_6 from electrical equipment in the industrial processes sector; and CH_4 emissions from poultry and other poultry under enteric fermentation in the agriculture sector
		The ERT encourages the Party to estimate and report emissions from all non-mandatory categories
Land use, land-use change and forestry[a]	Not complete	Mandatory: the carbon stock changes in dead organic matter and mineral soils under forest land remaining forest land (see para. 70 below)
		The ERT recommends that the Party estimate and report emissions from all mandatory categories
		Non-mandatory: the carbon stock changes in: dead organic matter in cropland remaining cropland; all pools for wetlands remaining wetlands; and dead wood (from cropland to grassland, wetlands and settlements; from grassland to cropland, wetlands, settlements and other land; and from other land to cropland)
		The ERT encourages the Party to estimate and report emissions from all non-mandatory categories
KP-LULUCF	Complete	

Issue	*ERT assessment*	*General findings and recommendations*
The ERT's findings on recalculations and time-series consistency		
Transparency of recalculations	Sufficiently transparent	
Time-series consistency	Sufficiently consistent	Please see paragraphs 31, 42, 67, 68, 69 and 77 below for category-specific findings
The ERT's findings on QA/QC procedures	Sufficient	Spain has elaborated a QA/QC plan and has implemented tier 1 QA/QC procedures in accordance with that plan. While the QA/QC plan is generally robust, the ERT finds that the mistakes (e.g. values in the NIR tables not matching values in the CRF tables) occurring in multiple sectors suggests that the implementation of the tier 1 QC procedures could be improved Please see paragraphs 25 and 89 below for category-specific recommendations
The ERT's findings on transparency	Sufficiently transparent	Please see paragraphs 12, 27, 33, 34, 40, 42–45, 51, 53, 56–58, 71, 74, 86 and 90 below for category-specific recommendations

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, MDI = metered dose inhalers, NIR = national inventory report, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

12. Regarding transparency, the ERT notes that insufficient information was included in the NIR to evaluate Spain's annual submission for some categories. During the review, Spain provided the ERT with the required information; however, the ERT recommends that Spain include additional information in the NIR to enhance transparency (e.g. see para. 27 below regarding the energy balance and paras. 40 and 42–45 below regarding confidential data for the industrial processes sector).

5. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

13. The NIR described the national system for the preparation of the inventory. As indicated by the Party in its NIR (pages 1.5 and 1.6), there were changes to the national system for the 2014 annual submission (see para. 115 below).

Inventory preparation

14. Table 4 contains the ERT's assessment of Spain's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Spain

Issue	*ERT assessment*	*ERT findings and recommendations*
Key category analysis		
Was the key category analysis performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Level and trend analysis performed, including and excluding LULUCF
Approach followed?	Tier 1 and, for 2012 only, tier 2	
Were additional key categories identified using a qualitative approach?	No	See paragraph 15 below
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	
Quantitative uncertainty (including LULUCF)	Level = 15.0% Trend = 1.8%	
Quantitative uncertainty (excluding LULUCF)	Level = 12.5% Trend = 1.8%	

Abbreviations: ERT = expert review team, IPCC good practice guidance = Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, LULUCF = land use, land-use change and forestry.

15. Regarding the key category analysis, the ERT notes that the NIR (section 1.5.1, pages 1.39 and 1.40) identifies some categories (additional to those identified in the key category assessment by level and trend) that may need particular attention. These include non-energy use of fuels; N_2O emissions from road transportation; the domestic versus international contribution to maritime traffic; use of HFCs in cooling and refrigeration activities; and emissions/removals from soil organic carbon. However, these categories were not listed in CRF table 7 as being key through the qualitative assessment. In response to a question raised by the ERT during the review, Spain explained that it performs a qualitative criteria assessment of certain categories with the aim of identifying categories that may have a significant influence on the overall inventory estimates. However, Spain does not consider these categories to be key, but as categories requiring further research for future submissions, as part of its continuous inventory improvement plan. The ERT recommends that Spain identify these categories as key, as the assessment conducted by the Party is consistent with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) with respect to the identification of key categories using qualitative criteria.

Inventory management

16. There were no changes to the inventory management process carried out by the Party for the 2014 annual submission, as indicated by the Party in its NIR. The description of the inventory management process, as contained in the report of the individual review of the annual submission of Spain submitted in 2013,[4] remains relevant. However, the ERT notes that Spain has substantially improved its system of responding to ERT questions, and all responses were received in a timely manner in the 2014 review cycle (see para. 18 below).

17. In response to a question raised by the ERT during the review, Spain explained that data from the European Union Emissions Trading System (EU ETS) have been progressively introduced into and used in the national inventory system to perform quality control (QC) analysis of activity data (AD), emission factors (EFs) and emission estimates of plants and categories. The quality assurance (QA)/QC procedures are explained throughout the NIR. The general approach is described and explained in the NIR (section 1.6, page 1.40) and at the category level. Spain also explained in the NIR that the comparison of regional and national inventories can also be considered as a QA/QC activity. Spain provided improved information in the NIR (page 1.11) on collaboration with regional governments in developing regional inventories.

6. Follow-up to previous reviews

18. The ERT noted that the previous review report indicated that Spain did not always reply to the questions from the previous ERT in a timely manner. The current ERT commends Spain for the improvements in this respect, as the Party has been able to respond very quickly to requests for information from the ERT before, during and after the review week. In addition, questions related to confidential data submitted within the review process were answered by Spain providing the requested confidential data and information.

19. Spain implemented an update to the agriculture sector (a recalculation of N_2O emissions due to grazing) and a number of recommendations made in the previous review report regarding the LULUCF sector, as detailed in NIR table 7.1.9.

[4] FCCC/ARR/2013/ESP, paragraphs 11–12.

20. Recommendations from previous reviews that have not yet been implemented, as well as issues the ERT identified during the 2014 annual review, are discussed in the relevant sectoral chapters of the report and in table 9 below.

B. Energy

1. Sector overview

21. The energy sector is the main sector in the GHG inventory of Spain. In 2012, emissions from the energy sector amounted to 265,549.07 Gg CO_2 eq, or 77.9 per cent of total GHG emissions. Since 1990, emissions have increased by 25.4 per cent. The key driver for the rise in emissions is the 35.6 per cent increase in emissions from transport. Within the sector, 34.6 per cent of the emissions were from energy industries, followed by 30.4 per cent from transport, 17.5 per cent from manufacturing industries and construction and 15.9 from other sectors. The remaining 1.7 per cent were from fugitive emissions from fuels. Emissions from the category other (fuel combustion activities) were reported as included elsewhere ("IE") or as not occurring ("NO").

22. Spain has made recalculations between the 2013 and 2014 annual submissions for this sector. The most significant recalculations made by Spain between the 2013 and 2014 annual submissions were in the following categories:

(a) Manufacturing industries and construction: for 2011, GHG emissions decreased by 19.2 per cent due to the revision of fuel consumption in this category to ensure consistency with the official energy balance submitted to the International Energy Agency (IEA) and the Statistical Office of the European Union (Eurostat), as recommended in previous review reports. The recalculations are explained in the NIR (section 3.5.5) and the energy balance is included in annex 2 to the NIR;

(b) Transport: for 1990, GHG emissions increased by 6.0 per cent due to new estimates of emissions from civil aviation and navigation as a consequence of using the fuel consumption data reported in the official energy balance submitted to IEA. The recalculation is explained in the NIR (section 3.8.5);

(c) Other sectors: for 2011, GHG emissions increased by 22.9 per cent due to the revision of the time series of fossil fuel consumption and renewable fuel consumption, mainly for the categories commercial and institutional, and agriculture, forestry and fisheries as a consequence of using the fuel consumption data reported in the official energy balance submitted to IEA. The recalculation is explained in the NIR (section 3.9.5).

23. The recalculations were made in response to recommendations made in the 2012 and 2013 review reports regarding the revision of the fuel consumption data used for the inventory, in order to ensure consistency with the official energy balance prepared by the Spanish Ministry of Industry, Energy and Tourism and submitted to IEA and Eurostat. The ERT commends Spain for this improvement. Compared with the 2013 annual submission, the recalculations decreased emissions in the energy sector by 3,326.12 Gg CO_2 eq (1.2 per cent) for 2011, and decreased total national emissions by 0.9 per cent. The recalculations were adequately explained in the NIR.

24. The ERT identified several inconsistencies between the CRF tables and the NIR. For example:

(a) CO_2 emissions from gaseous and solid fuels in the category public electricity and heat production for 2012: for solid fuels, 51,497 Gg CO_2 eq is reported in NIR table 3.2.1, while 52,331.62 Gg CO_2 eq is reported in CRF table 1.A(a); and for gaseous fuels,

16,404 Gg CO_2 eq is reported in the NIR, while 15,569.77 Gg CO_2 eq is reported in CRF table 1.A(a);

(b) CO_2 emissions from gaseous fuels in the category petroleum refining for 2012: 3,218 Gg CO_2 eq is reported in NIR table 3.3.1, while 3,112.76 Gg CO_2 eq is reported in CRF table 1.A(a);

(c) CO_2 emissions from the category road transportation for 1990: 50,419 Gg CO_2 eq is reported in NIR table 3.7.1, while 50,613.86 Gg CO_2 eq is reported in CRF table 1.A(a);

(d) In the last paragraph on page 3.58 of the NIR, a decrease of 19.2 per cent in emissions from manufacturing industries and construction is reported for 2010 (instead of 2011), and an increase in emissions of 10.5 per cent is reported for 2010 (instead of 1996).

25. In response to a question raised by the ERT during the review, Spain explained that these inconsistencies were due to input errors and that the values reported in the CRF tables are correct. The Party explained that the NIR will be corrected in the next annual submission. The ERT recommends that the Party enhance its QA/QC procedures in order to detect and correct this type of inconsistency.

26. In previous review reports, the ERT recommended that Spain include the official energy balance, as submitted to IEA and Eurostat, in its NIR, or include the address of the website where the energy balance is available. The ERT commends Spain for including the official energy balance in annex 2 to the NIR. Additionally, in response to a question raised by the ERT during the review, Spain submitted the energy questionnaires (for coal, oil, natural gas, renewables, wastes, and electricity and heat) used to elaborate the official energy balance submitted to IEA and Eurostat.

27. The ERT noted that Spain has included information on the EFs and net calorific values (NCVs) used for the emission estimates for all fuels in annex 8 to the NIR, thereby addressing a recommendation made in previous review reports. Further, in response to a question raised by the ERT during the review, the Party also submitted additional information regarding the energy questionnaires used to elaborate the official energy balance submitted to IEA and Eurostat (see para. 26 above) that contains disaggregated information on the EFs and NCVs. The ERT found this information to be very useful for the review but it is not included in the NIR because of its size. To improve transparency, the ERT recommends that Spain provide plant-specific NCVs and EFs in the corresponding chapters in the NIR or include the address of the website where this information can be consulted.

28. Regarding the uncertainty analysis, there is a significant range of uncertainties depending on the category, the type of fuel and the AD involved. The lower uncertainties correspond to the AD for fuel consumption in public electricity and heat production (2 per cent for solid fuels, 1.5 per cent for liquid fuels and 1.7 per cent for gaseous fuels) and to the CO_2 EFs for fuel consumption for that category (4 per cent for solid fuels, 2 per cent for liquid fuels and 1.5 per cent for gaseous fuels). The higher uncertainties correspond to the AD for biomass (100 per cent for the AD for fuel combustion in the category other sectors, most of which relate to the residential sector), the AD for navigation (around 75 per cent; see page 3.102 of the NIR) and the EFs for CH_4 (150 per cent) and N_2O (one order of magnitude) for fuel combustion in the category other sectors.

2. Reference and sectoral approaches

29. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 30–31 below.

Table 5
Review of reference and sectoral approaches

Issue	*Expert review team assessment*	*Paragraph cross references*
Difference between the reference approach and the sectoral approach for 2012	Energy consumption: –42.94 PJ, –1.2% CO_2 emissions: –735.57 Gg CO_2, –0.29%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	30
Are differences with international statistics adequately explained?	Yes	30
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	31
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

30. No problems were identified. The Party has made a significant effort to improve consistency between the fuel balance used in the inventory and the official energy balance submitted to IEA and Eurostat.

International bunker fuels

31. The ERT noted that the Party has not addressed the recommendations made in the 2012 and 2013 review reports regarding the consistency of the time series of CO_2 emissions from maritime bunkers. In response to a question raised by the ERT during the review, the Party submitted additional information regarding international maritime AD and emissions (information disaggregated by Selected Nomenclature for Air Pollution (SNAP) activity). The ERT considers that the information provided shows that the time series is consistent, and recommends that the Party provide this information in the NIR.

Feedstocks and non-energy use of fuels

32. No problems were identified.

3. Key categories

Civil aviation: liquid and gaseous fuels – CO_2, CH_4 and N_2O[5]

33. As indicated in previous review reports, Spain reports the AD and emissions from military aviation under civil aviation (Spain has reported mobile and stationary emissions from other (fuel combustion) as "IE" in CRF tables 1 and 1.A(a)). The ERT notes that this is not in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) because

[5] CH_4 and N_2O emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

emissions from military aviation should be reported in the category mobile under other (fuel combustion). The previous review report indicated that Spain was planning to report the AD and emissions from military aviation under other (fuel combustion) in the 2014 annual submission; however, this reallocation has not been implemented. In response to a question raised by the ERT during the review, Spain explained that to determine the fuel (and emissions) from military aviation, contact was established with the Ministry of Defence, which provided information on the annual fuel consumption of military aviation for the period 2008–2011 (no data were available for 2012). The Party also provided additional information on civil aviation (e.g. the information included in the *National Inventory on Emissions to the Atmosphere 1990–2012. Volume 2: Analysis by SNAP Activity*[6]), which clarified how emissions from civil and military aviation were distinguished. The ERT reiterates the recommendation made in the previous review report that Spain report the emissions from military aviation in the category mobile under other (fuel combustion) and exclude them from the category civil aviation. The ERT also recommends that the Party include, in its NIR, the information provided to the ERT during the review and explain any recalculations or reallocations.

Road transportation: liquid fuels – CO_2, CH_4 and N_2O[7]

34. Spain has reported 788,227.20 TJ of diesel oil consumption in road transportation for 2012 in CRF table 1.A(a). The ERT noted that this value differs from the amount of diesel oil consumption for road transportation in the official energy balance submitted in annex 2 to the NIR (19,091 kt, or 799,302 TJ). In response to a question raised by the ERT during the review, Spain explained that the figure in the official energy balance included in annex 2 to the NIR represents the amount of diesel that was consumed in "road transportation" and "industrial mobile machinery" and the figure reported in the CRF table represents the amount of diesel oil that was consumed in "road transportation" only (as the emissions due to "industrial mobile machinery" are included in the category other (manufacturing industries and construction). During the review, the Party provided additional disaggregated information that demonstrated that the two values are consistent. The ERT recommends that Spain provide a more transparent explanation of the allocation of fuel consumption for off-road machinery between different subcategories in the NIR.

Fugitive emissions from solid fuels – CH_4

35. In previous review reports, the ERT recommended that Spain undertake a study to determine the extent of CH_4 recovery and flaring in coal mining, and to assess the possible impacts of these activities on the emission estimates for fugitive emissions. Previous review reports also indicate that the Party assumes that all of the methane released from mining activities is emitted, given that no information is available regarding the installation of recovery systems in underground mining or on the amount of CH_4 recovered to be used later for energy or flaring. The ERT acknowledges that this approach results in an overestimation of the emissions reported in the inventory. In response to a question raised by the ERT during the review, the Party explained that the study is still under development and that the assumption used in the 2014 annual submission continues to be that all gas is emitted. To improve accuracy, the ERT recommends that Spain complete the aforementioned study and review the estimates of CH_4 fugitive emissions from solid fuels.

36. In response to questions raised by the ERT during the review, the Party provided additional detailed information on the determination of the CH_4 EFs for underground coal

[6] Available at <http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/sistema-espanol-de-inventario-sei-/volumen2.aspx>.

[7] CH_4 and N_2O emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

mining. The EFs are country-specific and derived from a single research work on the CH_4 content of the coal extracted from various national underground mining basins conducted in 1989.[8] The ERT found this document to be very useful and thus recommends that the Party include the web link to this document in the NIR.

C. Industrial processes and solvent and other product use

1. Sector overview

37. In 2012, emissions from the industrial processes sector amounted to 23,409.03 Gg CO_2 eq, or 6.9 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 1,262.81 Gg CO_2 eq, or 0.4 per cent of total GHG emissions. Since the base year, emissions have decreased by 17.2 per cent in the industrial processes sector, and by 16.5 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are: the decrease in emissions from chemical industry, which have been constantly falling since 1990 and were 73.3 per cent below 1990 levels in 2012, mainly due to the restructuring of the industry; the increase in cement production, which peaked in 2005 (at 42.0 per cent above 1990 levels) and fell from then onwards, reaching a value of 23.3 per cent below 1990 levels in 2012, with the fall being accelerated by the national economic downturn from 2008 onwards; and the decrease (and ultimate disappearance in 2012) of trifluoromethane (HFC-23) emissions from production of chlorodifluoromethane (HFC-22) due to the phase-out of the production of ozone-depleting substances under the Montreal Protocol, which more than offset the strong increase in emissions from consumption of halocarbons and SF_6, particularly from refrigeration and air conditioning. Within the industrial processes sector, 50.6 per cent of the emissions were from mineral products, followed by 32.1 per cent from consumption of halocarbons and SF_6, 12.0 per cent from metal production and 4.1 per cent from chemical industry. The remaining 1.2 per cent were from production of halocarbons and SF_6.

38. Spain has made recalculations between the 2013 and 2014 annual submissions for the industrial processes sector. The most significant recalculation made by Spain between the 2013 and 2014 annual submissions was in the category consumption of halocarbons and SF_6 due to a change in methodology and the update of AD. The French inventory methodology was used as the basis for the calculations for halocarbons, aimed at increasing completeness in this category. France's inventory was chosen as the basis for the calculations as the country is considered to be generally comparable to Spain with regard to the climate and the technologies used. The calculations were performed by developing country-specific EFs based on the French EFs for halocarbons for each category under consumption of halocarbons and SF_6, using appropriate drivers (e.g. population, number of households). Other recalculations were carried out as a result of the revision of the amount of gases used in fire extinguisher equipment, the correction of the AD for HFC consumption for aerosols for 2011, and the updating of the emissions from the manufacture of chlorodifluoromethane (HCFC-22) and 1,1,1,2-tetrafluoroethane (HFC-134a) for 2008 and 2011. For SF_6 emissions, the recalculations were the result of new information provided on electrical equipment in the context of a voluntary agreement. The impact of these recalculations on the GHG emissions for the category consumption of halocarbons and SF_6 was an increase of 56.8 per cent for 1990 and a decrease of 10.3 per cent for 2011.

[8] Asociación de Investigación Tecnológica de Equipos Mineros. 1989. *Proyecto de Medición de la Concentración de Grisú en Capa en Diversas Cuencas Carboníferas Españolas*. ("Measuring the methane concentration in the [coal] layers in several Spanish coal basins".)

39. The recalculations were made following methodological changes for the category consumption of halocarbons and SF_6 and for the AD and EFs for the remaining categories. Compared with the 2013 annual submission, the recalculations decreased emissions in the industrial processes sector by 885.02 Gg CO_2 eq (3.4 per cent) for 2011, and decreased total national emissions by 0.3 per cent. The recalculations were adequately explained.

40. The transparency of the reporting is limited in a number of categories, including cement production, limestone and dolomite use, iron and steel production, and production of halocarbons and SF_6, as the AD and/or EFs are not included in the NIR for confidentiality reasons. All confidential data were provided upon the request of the ERT in a timely manner, which had not been the case for previous reviews. The ERT commends Spain for this improved provision of data. In order to increase the transparency of the NIR, the ERT recommends that Spain continue to consider providing more information in the NIR without violating confidentiality. This might include the provision of qualitative data.

2. Key categories

Cement production – CO_2

41. Spain has used a tier 2 method, based on plant-specific monitoring data, to estimate CO_2 emissions from cement production. The ERT notes that Spain has indicated that these implied emission factors (IEFs) are confidential. The ERT also notes that Spain has not yet included information on a qualitative assessment of the CO_2 IEFs in the NIR, despite the fact that this issue had already been identified in previous review reports. However, the ERT considers that even if the IEFs are considered as confidential, an explanation of the variation in IEFs between plants and over time could be provided in the NIR. In addition, the NIR does not include information on whether the cement kiln dust (CKD) correction factor was included in the IEF. In response to a question raised by the ERT during the review, Spain provided the IEFs for all 36 facilities in the country and explained that for the emission estimates for each installation, where appropriate, the bypass dust or CKD leaving the kiln system is reflected in the calculation of the CO_2 emissions. Spain also clarified that the IEFs are considered as confidential and cannot therefore be included in the NIR. The ERT therefore reiterates the recommendation made in the previous review report that Spain provide a qualitative assessment of the IEFs, and include the information on CKD provided during the review in the NIR.

Nitric acid production – N_2O

42. The NIR (section 4.7.2) reports that a country-specific N_2O EF of 7 kg N_2O/t nitric acid has been used to estimate N_2O emissions for plants that were not in operation after 2008. This EF was provided by the National Chemical Association (FEIQUE) in 1998. The ERT noted that the default N_2O EF for modern plants provided in the Revised 1996 IPCC Guidelines (Reference Manual, table 2-7) is 2–9 kg N_2O/t nitric acid and in the IPCC good practice guidance (table 3.8) it is 2–10 kg N_2O/t nitric acid. In response to a question raised by the ERT during the review, Spain provided, under the confidentiality restrictions, information including the average N_2O EF for each production technology, as well as information on abatement devices. In order to increase transparency with regard to time-series consistency, the ERT recommends that Spain include a qualitative assessment of the N_2O EFs in its NIR.

Iron and steel production – CO_2, CH_4 and N_2O[9]

[9] CH_4 and N_2O emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

43. Spain has estimated the CO_2 emissions from the production of steel, pig iron and sinter using a tier 2 method by developing a carbon balance for the entire production process. The streams included in the carbon balances of these processes (blast furnace, steel and sinter) are presented in tables in the NIR in a transparent manner; however, the quantitative input and output flows of the carbon balance are not included in the CRF tables or in the NIR for confidentiality reasons. This transparency issue had already been raised in previous review reports. CO_2, CH_4 and N_2O emissions from flaring (residual gases) are included in this category (reported under other (iron and steel production)), whereas the emissions from coke production are reported as "IE" and included in the energy sector under the categories manufacture of solid fuels and other energy industries (combustion in coke ovens) and fugitive emissions from solid fuel transformation (fugitive emissions in door leakage and quenching). In response to a question raised by the ERT during the review, Spain forwarded information on the coke production carbon balance and on all carbon balances related to steel-making processes, indicating that the information was considered confidential. In order to increase transparency, the ERT reiterates the recommendation made in the previous review report that Spain consider how this information can be included in the NIR without violating confidentiality.

44. Spain has provided information on the installed technology in the country for sinter production, pig iron production in blast furnaces and steelworks in the NIR. Nevertheless, there is a lack of information on the number of coke plants and the technologies used for coking and quenching. In response to a question raised by the ERT during the review, Spain indicated that there are three coke plants and provided information on the technology (indicating that the information on the technology is considered confidential). In order to ensure the transparency of the inventory, the ERT encourages Spain to consider how this information can be included in the NIR without violating confidentiality.

Production of halocarbons and SF_6 – HFC-23

45. Spain has used a combination of tier 1 and tier 2 methods to estimate emissions of HFC-23 from the production of HCFC-22 for the period 1990–2011 (the last plant producing HCFC-22 ceased production in 2011). The NIR (page 4.50) indicates that the IPCC default EF for HFC-23 (4 per cent of the production of HFC-22, from the Revised 1996 IPCC Guidelines, Reference Manual, section 2.16.1) was used for the period 1990–1998, while measurements of HFC-23 emissions undertaken by the plants were used for the remaining years of the time series (1999–2011, as emissions ceased in 2012). In response to a question raised by the ERT during the review, Spain provided plant-specific HFC-23 emission data and IEFs by plant (this information was not included in the NIR). According to these data, the IPCC default EF was used for only one of the plants in the years 1990 and 1991 only, while measurements of HFC-23 emissions are available for the whole time series (1990–2011) for the remaining two plants. As the total HFC-23 emissions according to the confidential data were identical to the emissions reported for this category, the ERT considers that the methodological description provided in the NIR is probably incorrect (because the IPCC default EF has only been used for one of the three plants). The ERT considers that the use of the HFC-23 EF from the Revised 1996 IPCC Guidelines results in a conservative estimate and recommends that the Party clarify, in the methodological description provided in the NIR, that measured HFC-23 emissions were used for the entire time series for two of the three plants and that the IPCC default EF for HFC-23 was only used for one plant which closed after 1991. Furthermore, in order to increase transparency, the ERT also recommends that Spain consider whether it would be possible to publish the AD and HFC-23 EFs per plant, given that production in all plants has ceased.

D. Agriculture

1. Sector overview

46. In 2012, emissions from the agriculture sector amounted to 37,714.79 Gg CO_2 eq, or 11.1 per cent of total GHG emissions. Since 1990, emissions have increased by 0.1 per cent. The key driver for the rise in emissions is the increase in the livestock numbers of non-dairy cattle and swine (by 46.3 per cent and 61.8 per cent between 1990 and 2012, respectively). Within the sector, 48.2 per cent of the emissions were from agricultural soils, followed by 27.2 per cent from enteric fermentation, 22.4 per cent from manure management and 1.4 per cent from field burning of agricultural residues. The remaining 0.8 per cent were from rice cultivation. Emissions from prescribed burning of savannas were reported as "NO".

47. Spain has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations between the 2013 and 2014 annual submissions were in the following categories:

(a) Agricultural soils: GHG emissions increased by 2.4 per cent and 3.3 per cent for 1990 and 2011, respectively. The main reason for the recalculations is the modification of the methodology used to estimate N_2O emissions from pasture, range and paddock manure for the whole time series, which was undertaken in response to a recommendation made in the previous review report (see para. 60 below). The ERT noted that the new estimates replace the estimates adjusted in the previous review report (see para. 10 above);

(b) Field burning of agricultural residues: GHG emissions increased by 10.4 per cent for 2011 due to the publication of updated statistics on the area of crops.

48. The ERT noted that the N_2O emissions from pasture, range and paddock manure for every year in the period 2008–2011 reported in the 2013 annual submission were adjusted in the 2013 review report. Spain has recalculated these emissions for the entire time series (1990–2011). For example, for 2011, emissions of 8.07 Gg N_2O were reported before adjustment in the 2013 annual submission, while emissions of 9.67 Gg N_2O were reported in the 2014 annual submission.

49. Other reasons for the recalculations were the publication of updated AD with respect to the quantities of compost and sludge applied to agricultural soils and updated population statistics for sheep, horses and the area of crops.

50. Compared with the 2013 annual submission, the recalculations increased emissions in the agriculture sector by 636.37 Gg CO_2 eq (1.7 per cent) for 2011, and increased total national emissions by 0.2 per cent.

51. The ERT commends Spain for the level of effort undertaken in developing the country-specific methodologies and parameters used for the tier 2 approaches (e.g. for enteric fermentation and manure management). However, the ERT reiterates the recommendation made in the previous review report that Spain develop a summary table providing details of the references used in developing the country-specific methodologies and parameters used for the tier 2 approaches and also provide a table in the NIR detailing the main parameters used in the tier 2 methodologies.

2. Key categories

Enteric fermentation – CH_4

52. The ERT commends Spain for using detailed country-specific tier 2 methodologies to estimate CH_4 emissions from enteric fermentation for cattle, sheep and swine. For the

remaining animal species, tier 1 methods were used to estimate the emissions. The ERT considers this approach to be in line with the IPCC good practice guidance.

53. In response to a number of questions raised by the ERT during the review, Spain provided several detailed documents that outline the country-specific parameters, AD and methods used to derive the EFs. The ERT reiterates the recommendation made in previous review reports that Spain incorporate in the NIR detailed explanations of the AD, assumptions, parameters and EFs used for the country-specific emission estimates to improve transparency.

Manure management – CH_4 and N_2O

54. To estimate CH_4 emissions from manure management, Spain uses country-specific tier 2 methods for cattle, swine and poultry. The tier 1 method is used for all other animal species. The ERT considers this approach to be in line with the IPCC good practice guidance.

55. For dairy cattle, swine and poultry (hens and chickens), Spain has reported, in CRF table 4.B(b), the nitrogen excretion (Nex) per animal waste management system (AWMS) under "other" only (the notation key "NO" is reported for all other AWMS). In response to a number of questions raised by the ERT during the review, Spain provided a detailed description of the assumptions used for allocating Nex entirely to other AWMS. The Party explained that the methodology has been updated, including the use of new surveys of AWMS, and the results revealed that, in Spain, manure is usually managed in a series of interlinked systems, which are not simple to allocate to one of the "groups of AWMS" in CRF table 4.B(b). The ERT reiterates the recommendation made in the previous review report that Spain provide explanatory information in relation to AWMS in its NIR and in the documentation box to CRF table 4.B(b).

56. Spain has reported, in CRF table 4.B(b), liquid systems as an AWMS for horses, without providing any further explanatory information. Spain is one of only two Parties that report the use of liquid systems as an AWMS for horses. In response to a question raised by the ERT during the review, the Party provided information with regard to the use of liquid system AWMS for horses in Spain. The ERT recommends that Spain provide this information in the NIR to improve transparency.

57. Spain has reported, in CRF table 4.B(b), liquid systems as an AWMS for mules and asses, without providing any further explanatory information. Spain is the only Party that reports the use of liquid systems as an AWMS for mules and asses. In response to a question raised by the ERT during the review, the Party provided information with regard to the use of liquid system AWMS for mules and asses in Spain. The ERT recommends that Spain provide this information in the NIR to improve transparency.

58. The ERT notes that, in NIR table A3.2.3, Spain includes an AWMS referred to as "Other" without further explanatory information. In response to a question raised by the ERT during the review, Spain explained that there is no AWMS termed "Other" and that it does not refer to any particular manure management system in Spain. The ERT recommends that Spain omit the AWMS "Other" from NIR table A3.2.3 to improve the transparency of the emission estimates.

Agricultural soils – N_2O

59. Spain has estimated the N_2O emissions from agricultural soils using the IPCC tier 1 methodology, disaggregated as tiers 1a and 1b, and country-specific values for the following parameters: fraction of crop residue burned ($Frac_{BURN}$); fraction of nitrogen (N) synthetic fertilizer applied to soils that volatilizes as ammonia (NH_3) and nitrogen oxides (NO_X) ($Frac_{GASF}$); fraction of livestock Nex that volatilizes as NH_3 and NO_X ($Frac_{GASM}$); fraction of livestock N excreted and deposited onto soil during grazing ($Frac_{GRAZ}$); fraction

of total above-ground biomass of N-fixing crops that is N ($Frac_{NCRBF}$); and fraction of residue dry biomass that is N ($Frac_{NCRO}$), and the default EF (0.0125 kg N_2O-N/kg N) from the IPCC good practice guidance.

60. The ERT noted that the previous ERT calculated adjustments for the N_2O emissions from pasture, range and paddock manure.[10] The ERT commends Spain for revising the estimates of N_2O emissions from pasture, range and paddock manure for the whole time series and documenting the recalculation in its NIR, as recommended in the previous review report. Compared with the 2013 annual submission, the methodology used for the 2014 annual submission differs in that Spain no longer subtracts NH_3 and NO_X from total N deposited on grazed pasture. The methodology used is now in line with the IPCC good practice guidance.

3. Non-key categories

Field burning of agricultural residues – CH_4 and N_2O

61. The ERT notes that Spain has not addressed the recommendation made in the previous review report to include a separate section in the NIR with complete information regarding CH_4 and N_2O emissions from field burning of agricultural residues. The ERT therefore reiterates this recommendation.

62. Previous review reports have recommended that Spain include information on the legal status of field burning of agricultural residues. In response to a question raised by the ERT during the review, Spain provided the ERT with a list of relevant legislation, showing that field burning of agricultural residues is banned under a number of different national legislative measures. The ERT reiterates the recommendations made in previous review reports that Spain include references to appropriate legislation governing the field burning of agricultural residues in its NIR.

Rice cultivation – CH_4

63. Spain estimates the CH_4 emissions from rice cultivation using the CH_4 EF for Spain available in the Revised 1996 IPCC Guidelines (Reference Manual, table 4-9). The ERT reiterates the recommendation made in the previous review report that Spain include a separate section in its NIR with complete information and documentation pertaining to the estimation of emissions from rice cultivation.

E. Land use, land-use change and forestry

1. Sector overview

64. In 2012, net removals from the LULUCF sector amounted to 33,528.63 Gg CO_2 eq. Since 1990, net removals have increased by 43.9 per cent (from 23,304.79 Gg CO_2 eq). The key driver for the rise in removals is related to the increase in forest land sinks, and specifically to the contribution of land converted to forest land. Within the sector, 33,891.58 Gg CO_2 eq of net removals were from forest land, followed by 1,820.09 Gg CO_2 eq from cropland. Net emissions were reported from settlements (1,139.07 Gg CO_2 eq), grassland (996.24 Gg CO_2 eq), wetlands (42.05 Gg CO_2 eq) and other land (5.67 Gg CO_2 eq).

65. Spain has made recalculations between the 2013 and 2014 annual submissions for this sector for all subcategories, except for other (LULUCF):

[10] FCCC/ARR/2013/ESP, paragraphs 59 and 126–140.

(a) Forest land: net removals increased by 22.9 per cent and 35.5 per cent for 1990 and 2011, respectively, due to a completely revised and modified cartography, which has affected the estimates of the surface areas that remain in each land use and transitions between land uses, including the estimates of changes in the carbon content of dead wood and detritus, and the use of a new methodology to calculate living biomass (above-ground and below-ground) on lands that become forest land, as well as the inclusion of data from the fourth forestry inventory (IFN4)[11] for estimating the variation in the carbon living biomass pool in forest land remaining forest land;

(b) Cropland: net removals decreased by 6.8 per cent and 54.2 per cent for 1990 and 2011, respectively, due to: a completely revised and modified cartography, which has affected the estimates of the surface areas that remain in each land use and transitions between land uses; revisions to the estimates of changes in the carbon content of dead wood and detritus; and the estimation for the first time of N_2O emissions from disturbances associated with land-use conversion to cropland (previously reported as "IE, "NE" (not estimated), NO"). The ERT commends Spain for estimating and reporting these N_2O emissions;

(c) Grassland: net removals decreased by 60.3 per cent for 1990, and changed from net removals (–934.47 Gg CO_2 eq) to net emissions (851.96 Gg CO_2 eq) for 2011, due to a completely revised and modified cartography, which has affected the estimates of the surface areas that remain in each land use and transitions between land uses, including the estimates of changes in the carbon content of dead wood and detritus, and the inclusion of emissions from controlled burning;

(d) Wetlands: reported as "NE", "NO" in the 2013 annual submission, but CO_2 emissions from wetlands have been estimated in the 2014 annual submission. The ERT commends Spain for this improvement in the completeness of the inventory;

(e) Settlements: net emissions decreased by 16.1 per cent for 1990 but increased by 100.8 per cent for 2011 due to the review of the surface areas and the revision of the carbon content and detritus of dead wood for transitions to settlements and in soil carbon for transitions from grassland and cropland to settlements;

(f) Other land: reported as "NE", "NO" in the 2013 annual submission, but CO_2 emissions from other land have been estimated in the 2014 annual submission. The ERT commends Spain for this improvement in the completeness of the inventory.

66. The recalculations were made in response to the 2013 annual review report, and also following changes in AD and EFs. Compared with the 2013 annual submission, the recalculations increased net removals in the LULUCF sector by 4,620.13 Gg CO_2 eq (15.9 per cent) for 2011. The recalculations were adequately explained.

67. As indicated in previous review reports, Spain assumes that the land-use areas and soil management in the period 1970–1990 are constant, but the justification for this assumption is not provided in the NIR. In response to a question raised by the ERT during the review, Spain explained that it has analysed different possibilities to try to resolve this issue in recent years; however, the currently known sources are vague and apparently suffer from a large bias and uncertainty, the cartography of those sources does not match the current inventory cartography used for the years 1990–2012, and finding correspondence between them to ensure time-series consistency would require extensive work (some statistical data are available but are not directly suitable and are not comparable with the statistical information currently applied). The ERT noted that this issue remains unaddressed in the 2014 annual submission, and therefore reiterates the recommendation

[11] From the fourth Spanish *Inventario Forestal Nacional* (national forest inventory).

made in the previous review report that the Party explore the methods provided in chapter 5 of the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) in order to consider pre-1990 land uses and land-use changes in its reporting of GHG emissions/removals to improve the accuracy of its LULUCF sector inventory.

2. Key categories

Forest land remaining forest land – CO_2

68. The previous review report indicated that net removals from forest land remaining forest land followed a decreasing trend from 1990 to 2009 and then changed to an increasing trend from 2010 onwards. A similar trend was observed in the carbon stock changes in living biomass under this category. The previous ERT was of the view that this unusual trend was the result of Spain not considering pre-1990 forest transitions in its emission estimates. In addition, noting that Spain takes into account its national forest inventory (NFI) only since 1975, the previous ERT considered that the NFI for the earlier period would provide suitable data on transitions and that this would help to improve time-series consistency.

69. In response to a question raised by the current ERT during the review, Spain explained that it has explored different options without success until now, and continues its attempts to identify possible alternative sources of data, or methods that allow the use of existing sources in a consistent manner. The ERT reiterates the recommendation made in the previous review report that the Party explore ways of reconciling these data sources and improve the time-series consistency of its estimates of emissions and removals from forest land remaining forest land by considering the effect of pre-1990 forest transitions.

70. The ERT notes that Spain does not estimate the net carbon stock changes in dead organic matter and mineral soils for forest land remaining forest land. In response to a question raised by the ERT during the review, Spain recognized that forest land remaining forest land is a key category; nevertheless, Spain considered that the use of a tier 1 method is adequate because the dead organic matter and soil pools are not significant (above-ground and below-ground biomass are the biggest contributors to emissions/removals in the category). The ERT disagrees and therefore reiterates the recommendations made in previous review reports that Spain continue its efforts to move to a higher-tier method for the estimation of emissions from those pools under this key category and/or provide justification for the method used for the estimates.

71. Spain uses a biomass expansion factor (BEF) that is derived by multiplying two parameters in equation 3.2.3 of the IPCC good practice guidance for LULUCF: density and BEF_2 (biomass expansion factor for conversion of merchantable volume to above-ground tree biomass). This BEF is different from the ones presented in the IPCC good practice guidance for LULUCF (annex 3A.1, tables 3A.1.9 and 3A.1.10). The NIR (appendix 7.2) reports the country-specific values for BEF for hardwood and conifers that are used to estimate the carbon stock in biomass. In response to a question raised by the ERT during the review, Spain explained that the country-specific BEF values are the combination of BEF parameters and wood density (D), and, therefore, a unique value for the product of factors BEF and D is used, instead of separate values for each parameter. During the review, Spain provided the ERT with additional information to clarify the method used. To improve transparency, the ERT recommends that the Party include the information provided to the ERT during the review in its NIR.

Land converted to forest land – CO_2

72. Following the recommendations made in the previous review report, Spain has estimated for the first time and reported in CRF table 5.A the carbon stock changes in dead

organic matter for cropland, grassland and other land converted to forest land. A description of the methodologies used is reported in the NIR (pages 7.34–7.37 and annexes A3.3.8, A3.3.10 and A3.3.14). The ERT commends Spain for improving the completeness of its inventory by reporting these estimates.

73. To estimate the biomass growth rate for land converted to forest land in the 2013 submission, Spain used the value of biomass stocks per hectare for forest land remaining forest land and divided it by 20, assuming that all biomass growth is reached at year 20. Following the recommendation made in the previous review report, Spain has developed a different methodology to estimate the biomass growth rate in this subcategory based on information derived from the first forest inventory (IFN1), estimating the annual increase by species and province for species used in afforestation/reforestation, assuming that species reach maturity when their diameter at breast height equals 20 cm, and that growth is linear up to this diameter. The methodology is detailed in annex A3.3.2 to the NIR. The ERT commends Spain for its efforts to improve the estimates of biomass growth on land converted to forest land in the 2014 annual submission.

74. The previous review report recommended that, in order to improve the transparency of its NIR, Spain specify the sources of information used to estimate the areas of land converted to forest land, particularly for those resulting from afforestation and reforestation carried out before 1990. Spain reports in the 2014 NIR (table 7.2.2) the surface areas converted to forest land from other land uses (cropland, grassland, wetlands and other land), and a general explanation of the method of representation of the surface areas is presented in section 7.1.2. However, the ERT notes that it is not possible to identify the specific procedure used to estimate the annual variations for the land areas converted to forest land and therefore raised a question during the review, to which Spain explained that afforestation and reforestation statistics on agricultural land with or without subsidies from the European Union Common Agricultural Policy (CAP), provided by the Directorate General of Rural Development and Forestry Policy at the national level, are used to estimate the areas of land converted to forest land. The statistical information established mapping matrices of changes in land use in order to comply with the information required by the Kyoto Protocol. The information is that reported in the final Spanish transition matrix. The ERT recommends that Spain include this detailed explanation in the NIR.

75. Following the recommendations made in the previous review report, Spain has revised and modified the methodology used to estimate the biomass stock changes in land converted to forest land, including a new estimation of the composition of species and their growth rates. A detailed description is reported in annex A3.3.2 to the NIR. The ERT commends Spain for addressing this recommendation.

Cropland remaining cropland – CO_2

76. The previous review report strongly recommended that Spain implement and complete its improvement plans to ensure that its reporting conforms to the IPCC good practice guidance for LULUCF with respect to the reporting of emission estimates for this key category, including adequate cropland stratification by production system, as required in order to choose the stock change factors for organic soils in accordance with each combination of practices. Following the recommendations made in previous review reports, Spain has modified the methodology used for the estimation of changes in soil organic carbon in the 2014 annual submission, including stratification by use and by province, calculating the soil organic carbon to 30 cm instead of 1 m deep. The detailed description of the new procedures is reported in annex 3.3.8 to the NIR. The ERT commends Spain for improving the completeness of the inventory by reporting the estimates using the appropriate parameters.

77. The ERT noted the strong recommendations made in previous review reports that Spain explore ways of improving the accuracy and consistency of the time series for its estimates of the carbon stock changes in mineral soils for cropland (reported as "NO" for the period 1990–2006). The Party has reported additional information in the 2014 NIR (see paras. 100–105 below). The ERT considers that the recommendations have been addressed.

3. Non-key categories

Land converted to settlements – CO_2

78. In its 2013 annual submission, Spain reported that the area of land converted to settlements remained constant throughout the time series (1990–2011) at 20.47 kha/year. The previous ERT recommended that the Party complete the improvement plan and reconsider its estimation of emissions based on more recent AD for the entire time series in order to improve the accuracy of its estimates of the areas of land that have been converted to settlements. Following this recommendation, Spain has revised the areas of land converted to settlements for every year in the entire time series (1990–2012) by incorporating remote-sensing data from 2009 and 2012 (NIR, page 7.6) that show transitions from forest land to cropland, to wetlands and to settlements. Spain indicated that the use of other information sources helps to improve the accuracy of the areas of settlements and land converted to settlements, as described in the NIR (section 7.1.2). In response to a question raised by the current ERT during the review, Spain explained in more detail the methodology used to obtain data on surface transitions from land to settlements. The ERT acknowledged these explanations and recommends that Spain include them in its NIR.

79. In its 2013 annual submission, Spain reported CO_2 emissions from agricultural lime application as "NO" in CRF table 5(IV). The previous ERT recommended that Spain collect the necessary AD and estimate and report the CO_2 emissions from liming of agricultural soils or, if that was not possible, change the notation key from "NO" to "NE", and report on the progress of the studies on the application of lime on agricultural soils. In the 2014 annual submission, Spain has estimated CO_2 emissions due to the application of carbonate foam from sugar production to crops, which is the only lime applied to cropland in the country (NIR, sections 4.3.2 and 7.12). The ERT commends Spain for improving the estimates of the CO_2 emissions from agricultural lime application in the 2014 annual submission.

Biomass burning – CO_2, CH_4 and N_2O

80. For forest land remaining forest land, Spain reports CH_4 and N_2O emissions from biomass burning in controlled fires, but CO_2 emissions are reported as "IE". For land converted to forest land, Spain reports CO_2, CH_4 and N_2O emissions from controlled burning as "NO" (NIR, sections 7.2.4.1.4 and 7.2.4.2.4). The ERT commends Spain for this improvement (these emissions were reported as "NE" in the 2013 annual submission).

F. Waste

1. Sector overview

81. In 2012, emissions from the waste sector amounted to 12,872.89 Gg CO_2 eq, or 3.8 per cent of total GHG emissions. Since 1990, emissions have increased by 83.5 per cent. The key drivers for the rise in emissions are the increase in the population and the percentage of the population served by managed landfills and connected to wastewater treatment plants. Within the sector, 85.2 per cent of the emissions were from solid waste disposal on land, followed by 14.6 per cent from wastewater handling, 0.1 per cent from waste incineration and 0.1 per cent from other (waste).

82. Spain has made recalculations between the 2013 and 2014 annual submissions for this sector for all subcategories:

(a) Solid waste disposal on land: GHG emissions decreased by 4.8 per cent and 7.8 per cent for 1990 and 2011, respectively, due to the update of the AD for waste deposited, following the specifications given by the Sub-Directorate General for Waste ("Pilot plan for the characterization of domestic urban waste")[12] and the reallocation of some emissions to waste incineration;

(b) Wastewater handling: GHG emissions decreased by 4.9 per cent and 3.2 per cent for 1990 and 2011, respectively, due to the update of the discharge ratio, the industrial production indices, and the fraction of aerobic and anaerobic waste treatment for the period 1990–2011;

(c) Waste incineration: GHG emissions increased by 289.3 per cent and 1.5 per cent for 1990 and 2011, respectively, due to the reallocation of some emissions from solid waste disposal on land to waste incineration and the update of the fraction of waste burned in unmanaged landfills for the period 2001–2011;

(d) Other (waste): GHG emissions decreased by 88.9 per cent and 51.9 per cent for 1990 and 2011, respectively, due to the update of the fraction of sludge dried in open air and the biogas burned in flares in urban waste biomethanization plants.

83. The recalculations were made in response to the recommendations made in the previous review report and following changes in AD and EFs. Compared with the 2013 annual submission, the recalculations decreased emissions in the waste sector by 1,011.54 Gg CO_2 eq (7.3 per cent) for 2011, and decreased total national emissions by 0.3 per cent. The recalculations were adequately explained.

2. Key categories

Solid waste disposal on land – CH_4

84. The ERT noted that Spain still uses default values from the IPCC good practice guidance for some parameters in the calculation of its emission estimates (e.g. for the methane conversion factor (MCF) or the methane generation rate constant (k)). In the NIR, Spain explains some of the constraints on the availability of data for its estimates. For example, the data necessary to obtain country-specific k values, MCFs and oxidation factors are still scarce. Due to the lack of historical data and gaps in the time series, the Party has used extrapolation and interpolation to complete the time series of AD, including the amount of municipal solid waste deposited in landfills. In response to a question raised by the ERT during the review, the Party explained that it is working on applying the method provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) and considers that this will provide the opportunity to apply parameters that are more appropriate to the national circumstances, such as the k and DOC values. The ERT recommends that Spain improve the accuracy of the emission estimates by using more country-specific parameters.

85. In response to a recommendation made in the previous review report, Spain has provided additional clarification of the techniques applied to complete the time series of type compositions for household waste deposited in large landfills, specifically when no data are available for two consecutive years. Spain clarified that linear interpolation has been applied. The ERT commends Spain for improving the transparency of its reporting.

[12] *Plan piloto de caracterización de residuos urbanos de origen domiciliario* in the original text.

86. The ERT noted that there are still other instances where Spain has not provided, in the NIR, sufficient transparent information on the estimates for this key category. In response to a question raised by the ERT during the review, Spain provided additional information on management practices for recycling and composting, including the method and parameters used for data collection to estimate the amount of waste entering the composting process. The ERT recommends that Spain include this information in the NIR.

87. In the 2014 NIR, Spain explains that it is making efforts to reduce the uncertainty of its estimates, and is focusing on improving the characterization of waste streams and identifying the specific k values by type of waste. In response to a question raised by the ERT during the review, Spain also explained that it is currently reviewing the data source used for estimating the emissions from sludge spreading. The ERT recommends that Spain continue its efforts to reduce the uncertainties of the AD and EFs.

Wastewater handling – CH_4

88. As identified in previous review reports, Spain uses a limited number of country-specific values for the calculation of the CH_4 EFs for domestic, commercial and industrial wastewater: it uses default values from the IPCC good practice guidance for biological oxygen demand and chemical oxygen demand (COD); while for other parameters, such as the MCF and maximum CH_4-producing capacity, it uses values from the 2006 IPCC Guidelines (Spain has justified and documented their use). In response to a question raised by the ERT during the review on industrial point sources, Spain explained that it used the specific COD values for each type of industry that are obtained from the different studies on controlling wastewater discharge provided by the Department for Public Works and Water Quality from the Ministry of the Environment. Spain also explained that the parameters used for the MCF value could have evolved over time due to the incorporation of new processes in the industries; therefore, the Party is currently searching for the best information available with the necessary focal points (the Directorate-General for Water) in order to obtain the most appropriate values for those parameters. The ERT commends Spain for its efforts to keep the most appropriate available information updated for wastewater from the industries.

89. Spain has improved the quality of the information with respect to the different treatment systems applied to both wastewater and sludge. In the NIR, Spain explains that this has made it possible to estimate more accurate activity variables due to more precise information on the population whose wastewater is covered by these treatments, and also to obtain more accurate EFs depending on the different treatment systems applied for both the wastewater and the sludge lines. However, the ERT could not find information in the NIR on the QA/QC procedures applied to ensure the quality of the new information generated, and therefore recommends that the Party provide such information in the NIR.

3. Non-key categories

Other (waste) – CH_4

90. Two sources of CH_4 emissions are reported in this category: sludge spreading after removal of the sludge from wastewater treatment plants; and anaerobic digestion at biogas facilities (from biomethanization), including CH_4 flaring. The ERT considered that the NIR is not sufficiently transparent regarding the subcategories of the waste sector under which the emissions from the sludge fractions are reported: emissions from all sludge spread drying is reported in the category other (waste); after the drying process, part of the sludge is incinerated, while another part is deposited in landfills and the remaining part is reported in the category wastewater handling. In response to a question raised by the ERT during the review, Spain provided a table with the amounts of sludge generated and their destination (e.g. incineration, landfill, agricultural and other uses) for the entire time series

(1990–2012). The ERT recommends that Spain enhance the transparency of its reporting regarding the fractions of sludge and the treatment pathways by including in the NIR the information provided to the ERT during the review.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

91. Table 6 provides an overview of the information reported and parameters selected by Spain under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Issue	*Expert review team assessment*	*Findings and recommendations*
Assessment of Spain's reporting in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1	Sufficient	
Activities elected under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: forest management, cropland management Years reported: 1990, 2008–2012	See paragraphs 97–105 below
Period of accounting	Commitment period accounting	
Spain's ability to identify areas of land and areas of land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1	Sufficient	

92. Chapter G.I includes the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines and decisions 15/CMP.1 and 16/CMP.1. In accordance with decision 6/CMP.9, Parties will begin reporting of KP-LULUCF activities in the submissions due by 15 April 2015 using revised CRF tables, as contained in the annex to decision 6/CMP.9. Owing to this change in the CRF tables for KP-LULUCF activities, and the change from the first commitment period to the second commitment period, paragraphs 93–105 below contain the ERT's assessment of the Party's adherence to the current reporting guidelines and do not provide specific recommendations for reporting these activities in the 2015 annual submission.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

93. In the 2013 annual submission, Spain stated in the NIR (section 11.4.2) that the land use of forest land areas affected by management practices (including disturbances as a consequence of forest fires) does not change, and that the forest cover will recover, either by direct action or by a natural regeneration process. Therefore, these areas continue to be classified as forest land, although they temporarily have no stock. The previous ERT recommended that Spain provide sufficient information to demonstrate that those areas actually regenerate by tracking them and by establishing a procedure to systematically differentiate them from deforested areas, in line with the provisions of paragraph 8(b) of the annex to decision 15/CMP.1. Following this recommendation, Spain has included

additional information (maps) to verify that all changes of use from forest land to other land uses have been identified. Spain also explained that it is planning to make efforts to obtain additional information for future annual submissions. The ERT considers that this information is currently sufficient but encourages Spain to continue improving the information provided to demonstrate that forest land areas temporarily unstocked by natural disturbances or management practices are recovered to remain as forest land and are differentiated from permanently deforested areas.

Afforestation and reforestation – CO_2

94. Following the recommendations made in previous review reports to estimate the biomass increase in this subcategory, Spain has developed a methodology based on information derived from the IFN1, estimating the annual increase by species and province for species used in afforestation/reforestation, assuming that species reach maturity when their diameter at breast height equals 20 cm, and that growth is linear up to this diameter. The methodology is explained in annex A3.3.2 to the NIR. The ERT commends Spain for improving the completeness of the estimates of CO_2 emissions and removals from afforestation and reforestation in the 2014 annual submission.

95. The previous ERT recommended that Spain estimate and report the carbon stock changes for dead wood and litter or provide transparent and verifiable information demonstrating that these carbon pools are not net sources in afforestation and reforestation activities. In its 2014 annual submission, Spain has estimated the values of dead wood stock for forests. A detailed description of the calculations is included in annex A3.3.10 to the NIR. Spain has also calculated the carbon stock of litter on forest land. The methodology used to estimate the carbon stock is based on that used by Portugal. The ERT considers that using the methodology of Portugal is adequate because Portugal is a country bordering Spain and the characteristics of both countries' forests are largely similar. The ERT therefore considers that the recommendation has been addressed.

Deforestation – CO_2

96. Following the recommendation made in the previous review report to develop a system to identify and track the units of land deforested since 2006, Spain has used information from the changes in the surface layer measured by Still Photography 2009 and Still Photography 2012 for forest land converted to cropland, wetlands and settlements. These areas are visually interpreted based on aerial images, thereby fulfilling the requirements of decision 16/CMP.1. Spain has included other information sources to improve the accuracy of the areas of settlements and forest land converted to settlements, as described in the NIR (section 7.1.2). The ERT therefore considers that the recommendation has been addressed.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

97. In its 2013 annual submission, Spain reported the soil carbon pool under forest management activities (for which CO_2 emissions are key) as "NE", assuming a balance between gains and losses. The previous ERT strongly recommended that Spain report and account for the carbon stock changes in this pool or provide transparent and verifiable information demonstrating that the mineral soil carbon pool is not a net source in forest management activities. In the 2014 annual submission, Spain has demonstrated that this pool is not a net source of emissions. The NIR (annex A3.3.12) includes a quantitative justification that the soil organic carbon pool is not a source of emissions on the areas of forest management activities based on the results of the study "Development of regional

information system on the state of forest health",[13] which concludes that the annual variation per plot is negligible (0.006 per cent) and forest soils are not a source of carbon to the atmosphere. The ERT considers this issue resolved.

98. The previous ERT recommended that Spain provide transparent and verifiable information in accordance with the IPCC good practice guidance for LULUCF (page 4.30), demonstrating that the dead wood and litter carbon pools are not net sources of emissions in forest management activities. Following this recommendation, Spain has included additional information in the NIR (annexes 3.3.11 and 3.3.12) to justify that these deposits are not a net source, including additional information on the quantitative justification that dead wood is not a net source in the forest management activities, using data from the plots of the Network Monitoring Forest Damage Level I, and a quantitative justification that the deposits of detritus are not a net source on the areas of forest management activities based on measurements undertaken as part of the second, third and fourth (IFN2, IFN3, IFN4) cycles of the NFI. The ERT considers that the recommendation has been addressed.

99. Spain has reported CO_2 emissions from biomass burning in forest management as "IE" for controlled burning and as "NE" for wildfires in KP-LULUCF CRF table 5(KP-II)5. In response to a question raised by the ERT during the review, Spain explained that the notation key reported in the KP-LULUCF CRF table for controlled fires in forest management is "IE" because the emission estimate takes into account the variation in living biomass in the forest system, as explained in the NIR (section 7.2). For wildfires, Spain explained that CO_2 emissions from wildfires have been considered in the carbon stock changes for biomass.

Cropland management – CO_2

100. The previous ERT recommended that Spain correctly estimate and report the emissions from cropland management by tracking and including all of the areas under woody crops. Following that recommendation, Spain has obtained data on the specific practices in each area of woody crops considered and has included the arable surfaces in its 2014 annual submission. The description of the methodology is included in the NIR (sections 7.3.4.1 and 11.1.3.2). The ERT therefore considers that the issue has been resolved in the 2014 submission.

101. To estimate the carbon stock changes in mineral soils for cropland management, Spain reports that the source of information for the AD and soil surface area managed with maintenance techniques is ESYRCE,[14] which provides data for 2006 onwards (NIR table 7.3.5). In the absence of data prior to 2006, Spain linearly interpolates the carbon stock changes in mineral soils from 2006 to the beginning of the time series (1990), considering zero net emissions in 1990. The ERT notes that this is equivalent to assuming that all woody crops were under "conventional tillage" (NIR, annex 3.3.6) in 1990. In response to a question raised by the ERT during the review, Spain explained that this assumption is based on expert judgement from experts at the Ministry for Agriculture, Food and Environment and from the President of the Spanish Association of Conservation Agriculture – Live Soils.[15] Spain also explained that most of the conservative practices (practices other than "traditional tillage", as defined by ESYRCE and referenced in annex 3.3.6 to the NIR), were only employed as a result of the implementation of the European Union CAP, which

[13] TECMENA, S.L. 2010. *Desarrollo del Sistema de Información Nacional y Autonómico sobre el Estado de Salud de los Bosques (Sector Reservorio en Suelos).*

[14] *Encuesta sobre Superficies y Rendimientos Cultivos.* Available at <http://www.magrama.gob.es/es/estadistica/temas/estadisticas-agrarias/agricultura/esyrce/>.

[15] See <http://www.agriculturadeconservacion.org/>.

was not widely in place until the mid-1990s. The ERT recommends that Spain include the documented expert judgement in the NIR.

102. The ERT notes that "reduced tillage" (NIR, annex 3.3.6) was already the dominant practice in 2006, covering 47 per cent of the woody crops, versus only 18 per cent for "conventional tillage" (NIR table 7.3.5, "Woody crop surfaces by agricultural practice"). In addition, Spain provided the ERT with a set of recommendations on the management of olive groves issued in the 1960s by the Ministry of Agriculture. This set of recommendations includes a single tillage per year to a depth of around 20–25 cm, "deep enough to remove weed yet without turning the soil upside down". The ERT notes that this type of tillage corresponds slightly better to the definition of "reduced tillage" than to the definition of "full tillage" in table 3.3.4 of the IPCC good practice guidance for LULUCF (Spain also derives its EF for the stock changes in mineral soils for cropland management activity from this table). It was not clear to the ERT what the true rate was of "conventional tillage" of all technologies applied in 1990. The ERT considered that, should "conventional tillage" represent less than 100 per cent of management practices in 1990, the estimates provided by Spain for cropland management for 1990 (the base year) would potentially underestimate the net removals, and the estimates provided by Spain for cropland management for the period 2008–2012 would potentially overestimate the removals from the carbon stock changes in mineral soils. The ERT concluded that assuming 100 per cent conventional tillage in 1990 requires adequate documentation of the expert judgement to guarantee that emissions have not been underestimated in the base year and, as a result, that removals have not been overestimated in the period 2008–2012.

103. In addition, considering that the accounting of emissions/removals from cropland management activity under Article 3, paragraph 4, of the Kyoto Protocol is conducted on the basis of net–net accounting, this assumption could lead to a potential underestimation of removals from the carbon stock changes in mineral soils generated by practices other than "conventional tillage" for 1990 (the base year) and, thus, of the accounting of removals for the period 2008–2012. The ERT included this issue in its list of potential problems and further issues raised during the review.

104. In response to the ERT's list of potential problems and further issues, Spain provided the expert judgement applied to the estimation of net emissions/removals for the carbon stock changes in mineral soils for all woody crops for cropland management for 1990. The expert judgement has been adequately documented and archived in the national inventory system and clearly states that: the introduction of conservative soil practices on woody crops in Spain was mainly the result of a series of policies and measures during the 1990s and 2000s; land management practices considered more conservative for organic carbon were therefore practically non-existent on Spanish woody crops in 1990; based on the above information, it can be considered that conventional tillage practices were applied to all the land under woody crops in Spain in 1990; and these conventional tillage practices were of at least 20 cm depth with full inversion and, therefore, were causing substantial soil disturbance. The ERT noted that Spain also provided validation of the expert judgement by an external reviewer.

105. Taking into account the validated and adequately documented expert judgement, the ERT considers that Spain has successfully addressed the issue related to the assumption applied in the inventory to calculate the estimate of the carbon stock changes in the soil surface of woody crops, as well as the emissions/removals in mineral soils for the entire time series (1990–2012). The ERT considers that the potential problem has been resolved. The ERT recommends that Spain include the information provided during the review in its NIR.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

106. Spain has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[16] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

107. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol

108. Spain has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

109. Table 7 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review.

Table 7
Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2014 annual submission[a]		
	As reported	*Revised estimates*	*Final accounting quantity*[b]
Afforestation and reforestation			
Non-harvested land	–43 346 655		–43 346 655
Harvested land	NA, NO		NA, NO
Deforestation	3 417 275		3 417 275
Forest management	–12 283 333		–12 283 333
Article 3.3 offset[c]	0		0
Forest management cap[d]	–12 283 333		–12 283 333
Cropland management	–567 872		–567 872
Grazing land management	NA		NA
Revegetation	NA		NA

[16] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

Abbreviations: CRF = common reporting format, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] The values included under the 2014 annual submission are the cumulative accounting values for 2008, 2009, 2010, 2011 and 2012, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2012.

[b] The "final accounting quantity" is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2014 annual submission.

[c] "Article 3.3 offset": for the first commitment period, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[d] In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

110. Based on the information provided in table 7 for the activity afforestation and reforestation, Spain shall: for non-harvested land, issue 43,346,655 removal units (RMUs) in its national registry; and for harvested land, not issue or cancel any units in its national registry.

111. Based on the information provided in table 7 for the activity deforestation, Spain shall cancel 3,417,275 assigned amount units, emission reduction units, certified emission reduction units and/or RMUs in its national registry.

112. Based on the information provided in table 7 for the activity forest management, Spain shall issue 12,283,333 RMUs in its national registry.

113. Based on the information provided in table 7 for the activity cropland management, Spain shall issue 567,872 RMUs in its national registry.

Calculation of the commitment period reserve

114. Spain has reported its commitment period reserve in its 2014 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (1,499,576,336 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure. However, the ERT noted that while the result of the calculation of the commitment period reserve is correct, the calculation process is incorrect: Spain has compared 90 per cent of the value of the assigned amount with five times the GHG emissions in 2011, but it should have compared it to five times the emissions in 2012. The ERT recommends that the Party use the correct calculation process for the commitment period reserve.

3. Changes to the national system

115. Spain reported that there are changes in its national system since the previous annual submission. The Party described the changes, which include updating the National Statistical Plan, changes in the list of focal points, and the formation of a new working group on livestock, in its NIR. The ERT concluded that the Party's national system

continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

116. Spain reported that there are changes in its national registry since the previous annual submission. The Party described the changes, including changes to the structure of the database, changes to the conformance to technical standards for data exchange, and changes to the results of test procedures, in its NIR. Spain explained in the NIR that each change was limited and only affected EU ETS functionality. The ERT concluded that, taking into account the confirmed changes in the national registry, Spain's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

117. Spain reported in the NIR (page 12.3) that a browser compatibility issue has been temporarily resolved by providing the relevant information under the section on climate change of the official web page of the Ministry of Agriculture, Food and Environment until a new web page can be set up. In response to a question raised by the ERT, Spain explained that it released a revised version of the website for the national registry[17] in July 2014 that addresses the issue.

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

118. Consistent with paragraph 23 of the annex to decision 15/CMP.1, Spain provided information relating to how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention.

119. Spain reported that there is a change in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The Party described the change, which related to the inclusion of a reference to the additional information on the minimization of adverse impacts included in Spain's first biennial report, in its NIR. The ERT concluded that, taking into account the confirmed change in the reporting, the information provided is complete and transparent.

120. Spain highlights its work to minimize adverse impacts with the Ibero-American Network of Climate Change Offices (RIOCC), the Regional Portal for Technological Transfer and Action against Climate Change (REGATTA) in Latin America and the Caribbean, and the clean development mechanism. Many Spanish agencies are involved in efforts to minimize adverse impacts, including the Institute for Energy Saving and Diversification (IDAE) and CIEMAT. Spain also provided a summary table with information on other relevant initiatives related to renewable energy, climate observation systems, adaptation and mitigation, among other related areas.

[17] Available at <http://www.renade.es>.

III. Conclusions and recommendations

A. Conclusions

121. Table 8 summarizes the ERT's conclusions on the 2014 annual submission of Spain, in accordance with the Article 8 review guidelines.

Table 8
Expert review team's conclusions on the 2014 annual submission of Spain

Issue	*Expert review team assessment*	*Paragraph cross references for identified problems*
The ERT concludes that the inventory submission of Spain is complete with regard to categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2012		
Annex A sources[a]	Complete	
LULUCF[a]	Not complete	See table 3 and paragraph 70 above
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Spain has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	
Spain's inventory is in accordance with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF	Generally	See paragraphs 15 and 33 above
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Generally	See paragraph 114 above
Spain has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	See paragraph 117 above
Did Spain provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team,

IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance or the IPCC good practice guidance for LULUCF).

B. Recommendations

122. The ERT identified the issues for improvement listed in table 9. All recommendations are for the next annual submission, unless otherwise specified.

Table 9
Recommendations identified by the expert review team

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
Cross-cutting	Key category analysis	Consider the categories that may need particular attention based on a qualitative assessment as key categories	No	15
Energy	QA/QC	Enhance the QA/QC procedures in order to detect and correct inconsistencies between the CRF tables and the NIR	No	25
		Provide plant-specific NCVs and EFs in the corresponding chapters in the NIR or include the address of the website where this information can be consulted	No	27
	International bunker fuels	Include the information on international maritime AD and emissions (information disaggregated by SNAP activity) in the NIR	No	31
	Civil aviation: liquid and gaseous fuels – CO_2, CH_4 and N_2O	Report the emissions from military aviation in the category mobile under other (fuel combustion) and exclude them from the category civil aviation	Yes	33
		Include information on how emissions from military aviation are distinguished from civil aviation; and explain any recalculations or reallocations	No	33
	Road transportation: liquid fuels – CO_2, CH_4 and N_2O	Provide a more transparent explanation of the allocation of fuel consumption for off-road machinery between different subcategories in the NIR	No	34

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
	Fugitive emissions from solid fuels – CH_4	Complete the study to determine the extent of CH_4 recovery and flaring in coal mining, and to assess the possible impacts of these activities on the emission estimates for fugitive emissions; and review the estimates of CH_4 fugitive emissions from solid fuels to improve accuracy	No	35
		Include the web link to the reference used to determine the CH_4 EFs for underground coal mining	No	36
Industrial processes and solvent and other product use	Transparency	Continue to consider providing more information in the NIR without violating confidentiality, in order to increase transparency	No	40
	Cement production – CO_2	Provide a qualitative assessment of the IEFs, and include the information on CKD provided during the review in the NIR	Yes	41
	Nitric acid production – N_2O	Include a qualitative assessment of the N_2O EFs in the NIR	No	42
	Iron and steel production – CO_2, CH_4 and N_2O	Consider how the information on the coke production carbon balance and on all carbon balances related to steel-making processes can be included in the NIR without violating confidentiality	Yes	43
		Clarify, in the methodological description provided in the NIR, that measured HFC-23 emissions were used for the entire time series for two of the three plants and that the IPCC default EF for HFC-23 was only used for one plant which closed after 1991	No	45
		Consider whether it would be possible to publish the AD and HFC-23 EFs per plant, given that production in all plants has ceased	No	45
Agriculture	Transparency	Develop a summary table providing details of the references used in developing the country-specific methodologies and parameters used for the tier 2 approaches and also provide a table in the NIR detailing the main parameters used in the tier 2 methodologies	Yes	51

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
	Enteric fermentation – CH_4	Incorporate, in the NIR, detailed explanations of the AD, assumptions, parameters and EFs used for the country-specific emission estimates to improve transparency	Yes	53
	Manure management – CH_4 and N_2O	Provide explanatory information in relation to AWMS in the NIR and in the documentation box to CRF table 4.B(b)	Yes	55
		Provide information with regard to the use of liquid system AWMS for horses in Spain in the NIR to improve transparency	No	56
		Provide information with regard to the use of liquid system AWMS for mules and asses in Spain in the NIR to improve transparency	No	57
		Omit the AWMS "Other" from NIR table A3.2.3 to improve the transparency of the emission estimates	No	58
	Field burning of agricultural residues – CH_4 and N_2O	Include a separate section in the NIR with complete information regarding CH_4 and N_2O emissions	Yes	61
		Include references to appropriate legislation governing the field burning of agricultural residues in the NIR	Yes	62
	Rice cultivation – CH_4	Include a separate section in the NIR with complete information and documentation pertaining to the estimation of emissions from rice cultivation	Yes	63
LULUCF	Accuracy	Explore the methods provided in chapter 5 of the IPCC good practice guidance for LULUCF in order to consider pre-1990 land uses and land-use changes in the reporting of GHG emissions/removals to improve the accuracy of the LULUCF sector inventory	Yes	67
	Forest land remaining forest land – CO_2	Explore ways of reconciling the data sources and improve the time-series consistency of the estimates of emissions and removals from forest land remaining forest land by considering the effect of pre-1990 forest transitions	Yes	69

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
	Forest land remaining forest land – CO_2	Report the carbon stock changes in dead organic matter and mineral soils; continue efforts to move to a higher-tier method for the estimation of emissions from those pools under this key category and/or provide justification for the method used for the estimates	Yes	Table 3, paragraph 70
		Include the information provided during the review to clarify the country-specific BEF values in the NIR	No	71
	Land converted to forest land – CO_2	Include the explanation on the sources of information used to estimate the areas of land converted to forest land, particularly for those resulting from afforestation and reforestation carried out before 1990, in the NIR	No	74
	Land converted to settlements – CO_2	Include the methodology used to obtain data on surface transitions from land to settlements in the NIR	No	78
Waste	Solid waste disposal on land – CH_4	Improve the accuracy of the emission estimates by using more country-specific parameters	No	84
		Include information on management practices for recycling and composting, including the method and parameters used for data collection to estimate the amount of waste entering the composting process, in the NIR	No	86
		Continue the efforts to reduce the uncertainties of the AD and EFs	No	87
	Waste water handling – CH_4	Provide information in the NIR on the QA/QC procedures applied to the information on different treatment systems applied to both wastewater and sludge	No	89
	Other (waste) – CH_4	Enhance the transparency of the reporting regarding the fractions of sludge and the treatment pathways by including the information on the amounts of sludge generated and their destination (e.g. incineration, landfill, agricultural and other uses) for the entire time series (1990–2012) in the NIR	No	90

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross references*
Activities under Article 3, paragraph 4, of the Kyoto Protocol	Cropland management – CO_2	Include the documented expert judgement on the assumption that all woody crops were under "conventional tillage" in 1990	No	101
		Include the information provided during the review on the expert judgement applied to the estimation of net emissions/removals for the carbon stock changes in mineral soils for all woody crops for cropland management for 1990 in the NIR	No	105
Information on Kyoto Protocol units	Commitment period reserve	Use the correct calculation process for the commitment period reserve	No	114

Abbreviations: AD = activity data, AWMS = animal waste management system, BEF = biomass expansion factor, CKD = cement kiln dust, CRF = common reporting format, EF = emission factor, GHG = greenhouse gas, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, LULUCF = land use, land-use change and forestry, NCV = net calcrific value, NIR = national inventory report, QA/QC = quality assurance/quality control, SNAP = Selected Nomenclature for Air Pollution.

IV. Questions of implementation

123. No questions of implementation were identified by the ERT during the review.

Annex I

Information to be included in the compilation and accounting database

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2012, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	**1 499 576 336**			**1 499 576 336**
Annex A emissions for 2012				
CO_2	276 636 640			276 636 640
CH_4	32 318 019			32 318 019
N_2O	24 018 783			24 018 783
HFCs	7 574 170			7 574 170
PFCs	41 170			41 170
SF_6	219 811			219 811
Total Annex A sources[c]	**340 808 593**			**340 808 593**
Activities under Article 3, paragraph 3, for 2012				
3.3 Afforestation and reforestation on non-harvested land for 2012	–8 558 408			–8 558 408
3.3 Afforestation and reforestation on harvested land for 2012	NA, NO			NA, NO
3.3 Deforestation for 2012	650 787			650 787
Activities under Article 3, paragraph 4, for 2012[d]				
3.4 Forest management for 2012	–23 594 547			–23 594 547
3.4 Cropland management for 2012	–1 517 221			–1 517 221
3.4 Cropland management for the base year	–1 036 499			–1 036 499
3.4 Grazing land management for 2012				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2012				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2011

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2011				
CO_2	280 922 730			280 922 730
CH_4	32 305 904			32 305 904
N_2O	24 556 824			24 556 824
HFCs	7 790 095			7 790 095
PFCs	64 779			64 779
SF_6	246 817			246 817
Total Annex A sources[c]	**345 887 149**			**345 887 149**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–8 683 026			–8 683 026
3.3 Afforestation and reforestation on harvested land for 2011	NA, NO			NA, NO
3.3 Deforestation for 2011	652 951			652 951
Activities under Article 3, paragraph 4, for 2011[d]				
3.4 Forest management for 2011	–23 696 958			–23 696 958
3.4 Cropland management for 2011	–1 337 884			–1 337 884
3.4 Cropland management for the base year	–1 036 499			–1 036 499
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	280 377 628			280 377 628
CH_4	32 337 270			32 337 270
N_2O	25 949 051			25 949 051
HFCs	8 203 190			8 203 190
PFCs	72 714			72 714
SF_6	241 148			241 148
Total Annex A sources[c]	**347 181 003**			**347 181 003**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–8 719 502			–8 719 502
3.3 Afforestation and reforestation on harvested land for 2010	NA, NO			NA, NO
3.3 Deforestation for 2010	655 064			655 064
Activities under Article 3, paragraph 4, for 2010[d]				
3.4 Forest management for 2010	–23 758 533			–23 758 533
3.4 Cropland management for 2010	–1 041 500			–1 041 500
3.4 Cropland management for the base year	–1 036 499			–1 036 499
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	293 732 285			293 732 285
CH_4	33 284 399			33 284 399
N_2O	24 796 664			24 796 664
HFCs	7 519 759			7 519 759
PFCs	84 169			84 169
SF_6	241 875			241 875
Total Annex A sources[c]	**359 659 151**			**359 659 151**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–8 725 020			–8 725 020
3.3 Afforestation and reforestation on harvested land for 2009	NA, NO			NA, NO
3.3 Deforestation for 2009	728 992			728 992
Activities under Article 3, paragraph 4, for 2009[d]				
3.4 Forest management for 2009	–23 802 047			–23 802 047
3.4 Cropland management for 2009	–568 851			–568 851
3.4 Cropland management for the base year	–1 036 499			–1 036 499
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	333 181 725			333 181 725
CH_4	32 486 041			32 486 041
N_2O	25 064 127			25 064 127
HFCs	7 327 346			7 327 346
PFCs	120 663			120 663
SF_6	264 251			264 251
Total Annex A sources[c]	**398 444 153**			**398 444 153**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–8 660 699			–8 660 699
3.3 Afforestation and reforestation on harvested land for 2008	NA, NO			NA, NO
3.3 Deforestation for 2008	729 481			729 481
Activities under Article 3, paragraph 4, for 2008[d]				
3.4 Forest management for 2008	–23 975 702			–23 975 702
3.4 Cropland management for 2008	–1 284 909			–1 284 909
3.4 Cropland management for the base year	–1 036 499			–1 036 499
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf# page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Spain 2014. Available at <http://unfccc.int/resource/docs/2014/asr/esp.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2014. Available at <http://unfccc.int/resource/webdocs/sai/2014.pdf>.

FCCC/ARR/2013/ESP. Report of the individual review of the annual submission of Spain submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/esp.pdf>.

Standard independent assessment report template, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Martín Fernández Díez-Picazo (Ministry of Agriculture, Food and Environment), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Spain:

Asociación de investigación tecnológica de equipos mineros (AITEMIN) (1989). *Proyecto de medición de la concentración de grisú en capa en diversas cuencas carboníferas españolas*. (Measuring the methane concentration in the [coal] layers in several Spanish coal basins).

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
BEF	biomass expansion factor
CAP	European Union Common Agricultural Policy
CH_4	methane
CKD	cement kiln dust
cm	centimetre
COD	chemical oxygen demand
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
D	wood density
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU ETS	European Union Emissions Trading System
Eurostat	Statistical Office of the European Union
$Frac_{BURN}$	fraction of crop residue burned
$Frac_{GASF}$	fraction of synthetic fertilizer nitrogen applied to soils that volatilizes as ammonia and nitrogen oxides
$Frac_{GASM}$	fraction of livestock nitrogen excretion that volatilizes as ammonia and nitrogen oxides
$Frac_{GRAZ}$	fraction of livestock nitrogen excreted and deposited onto soil during grazing
$Frac_{NCRBF}$	fraction of crop biomass that is nitrogen
$Frac_{NCRO}$	fraction of residue dry biomass that is nitrogen
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HCFC-22	chlorodifluoromethane
HFCs	hydrofluorocarbons
HFC-134a	1,1,1,2-tetrafluoroethane
HFC-22	chlorodifluoromethane
HFC-23	trifluoromethane
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
k	methane generation rate constant
kha	kilohectare
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kt	kilotonne
LULUCF	land use, land-use change and forestry
m	metre
MCF	methane conversion factor
N	nitrogen

NH_3	ammonia
N_2O	nitrous oxide
NA	not applicable
Nex	nitrogen excretion
NO_X	nitrogen oxide
NFI	national forest inventory
NCV	net calorific value
NE	not estimated
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SNAP	Selected Nomenclature for Air Pollution
t	tonne
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change